IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	10/591,629
Applicants:	Ashutosh MISRA, et al.
Filed Internationally:	February 24, 2005
US National:	September 5, 2006
Title:	METHOD FOR FORMING DIELECTRIC OR METALLIC FILMS
TC/A.U.:	2818
Examiner:	Arman Khosraviani
Docket No.:	Serie 6550 CIP
Customer No.:	40582

AMENDMENT AFTER FINAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Final Office Action of **April 29, 2008**, please amend the application as follows:

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1 – 18 (cancelled)

Claim 19 (previously presented): A method for forming a MSiN dielectric film comprising the steps of:

a) vaporizing a metal source (M) to form a vaporized metal source;
b) providing a vapor phase silicon source, wherein said silicon source has a vapor pressure of at least 50 torr at about 20°C;
c) feeding a plurality of precursors to a deposition device, wherein said precursors comprise said vaporized metal source, said silicon source, and a nitrogen source; and
d) forming a dielectric film, wherein said dielectric film is formed in a single step such that the desired final film is formed absent a post deposition step.

Claim 20 (previously presented): A method for forming a MSiO metallic film comprising the steps of:

a) vaporizing a metal source to form a vaporized metal source;
b) providing a vapor phase silicon source, wherein said silicon source has a vapor pressure of at least 50 torr at about 20°C;
c) feeding a plurality of precursors to a deposition device, wherein said precursors comprise said vaporized metal source, said silicon source, and an oxygen source; and

d) forming a metallic film, wherein said metallic film is formed in a single step such that the desired final film is formed absent a post deposition step.

Claim 21 (previously presented): The method of claim 19, wherein said silicon source comprises a molecular structure absent carbon and/or a molecular structure absent chlorine.

Claim 22 (cancelled)

Claim 23 (cancelled)

Claim 24 (previously presented): The method of claim 19, wherein said silicon source is selected from the group comprising:

a) disiloxane;
b) trisilylamine;
c) disilylamine;
d) silylamine;
e) tridisilylamine;
f) aminodisilylamine;
g) tetrasilyldiamine;
h) disilane;
i) derivatives of disilane and/or trisilane; and
j) mixtures thereof.

Claim 25 (previously presented): The method of claim 20, wherein said oxygen source comprises a molecular structure absent carbon and/or a molecular structure absent chlorine.

Claim 26 (previously presented): The method of claim 20, wherein said oxygen source is selected from the group comprising:

a) oxygen;
b) nitrous oxide;
c) ozone;
d) disiloxane; and
e) mixtures thereof.

Claim 27 (previously presented): The method of claim 19, wherein said nitrogen source comprises a molecular structure absent carbon and/or a molecular structure absent chlorine.

Claim 28 (previously presented): The method of claim 19, wherein said nitrogen source is the same as said metal source or said silicon source.

Claim 29 (previously presented): The method of claim 19, wherein said nitrogen source is ammonia.

Claim 30 (previously presented): The method of claim 19, wherein said metal source is selected from the group consisting of a dialkylamino, and alkoxy ligands.

Claim 31 (previously presented): The method of claim 19, wherein said metal source is an inorganic compound selected from the group consisting of:

a) hafnium (Hf);
b) zirconium (Zr);
c) titanium (Ti);
d) niobium (Nb);
e) tantalum (Ta);
f) scandium (Sc);

g) yttrium (Y);
h) lanthanum (La);
i) gadolinium (Gd);
j) europium (Eu);
k) praseodymium (Pr) or any another lanthanide (Ln); and
l) mixtures thereof.

Claim 32 (previously presented): The method of claim 19, wherein the amounts of said metal source and said silicon source in said desired final composition of said dielectric film are controlled independently.

Claim 33 (previously presented): The method of claim 19, wherein said dielectric film is completed by using a chemical vapor deposition process.

Claim 34 (previously presented): The method of claim 19, wherein said dielectric film step is completed by using an atomic layer deposition process.

Claim 35 (previously presented): A MSiN dielectric film obtained in accordance with the process of claim 19.

Claim 36 (previously presented): A MSiO metallic film obtained in accordance with the process of claim 20.

Claim 37 (previously presented): The method of claim 20, wherein said silicon source comprises a molecular structure absent carbon and/or a molecular structure absent chlorine.

Claim 38 (previously presented): The method of claim 20, wherein said silicon source is selected from the group comprising:

a) disiloxane;
b) trisilylamine;
c) disilylamine;
d) tridisilylamine;
e) aminodisilylamine;
f) tetrasilyldiamine;
g) derivatives of disilane and/or trisilane; and
h) mixtures thereof.

Claim 39 (previously presented): The method of claim 20, wherein said oxygen source is the same as said metal source or said silicon source.

Claim 40 (previously presented): The method of claim 20, wherein said metal source is an inorganic compound selected from the group consisting of:

a) hafnium (Hf);
b) zirconium (Zr);
c) titanium (Ti);
d) niobium (Nb);
e) tantalum (Ta);
f) scandium (Sc);
g) yttrium (Y);
h) lanthanum (La);
i) gadolinium (Gd);
j) europium (Eu);
k) praseodymium (Pr) or any another lanthanide (Ln); and
l) mixtures thereof.

Claim 41 (previously presented): The method of claim 20, wherein the amounts of said metal source and said silicon source in said desired final composition of said dielectric film are controlled independently.

REMARKS / ARGUMENTS

In complete response to the Final Office Action dated April 29, 2008, on the above identified application, reconsideration is respectfully requested. Claims 19, 20, and 24-41 are pending in this application.

Finality of Instant Office Action:

The Examiner states that this rejection is final, citing MPEP §706.07(a). The Applicants traverse the finality of this rejection.

MPEP §706.07(a) states:

> *"Under present practice, second or any subsequent actions on the merits shall be final, except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims, nor based on information submitted in an information disclosure statement filed during the period set forth in **37 CFR 1.97(c)** with the fee set forth in **37 CFR 1.17(p)**.."*

The Applicants respectfully contend that the current office action contains a new ground of rejection not necessitated by Applicant's amendment of the claims. Applicant's previous response, submitted on 1/24/2008 contained only claim amendments which consolidated existing claimed subject matter. Therefore, the Applicants respectfully content that the finality of the instant office action should be traversed.

Claim Rejections under 35 U.S.C. § 103(a):

Claims 19 – 20, 26, 31, 33, 35-36 and 40 are rejected as being unpatentable over Colombo et al ("Colombo '678"). For at least the following reasons, the Applicants respectfully contend that the claims of the instant application are not obvious in light of Colombo '678.

Selection of a silicon source with a vapor pressure of at least 50 torr at about 20 C is not an obvious selection, in that numerous silicon containing compounds which do not meet this criterion exist. Precursors which do not meet this criterion require extra processing steps and/or equipment (bubbler, vaporizer, etc). As Colombo '678 makes no mention of the silicon precursor's vapor pressure, therefore selection of a precursor which meets this criteria cannot be a simple optimization asserted by the Examiner. Colombo '678 describes general process conditions (see para 12) but does not the properties of the silicon precursor.

Furthermore, Colombo '678 does not describe a method of forming a MSiN or MSiON dielectric film in a single step such that a post deposition step is not necessary. Colombo '678 requires post deposition steps (see para 0018 and 0025), and therefore teaches away from the single step approach of the instant invention. For at least these reasons, the Applicants respectfully contend that the basis for this rejection should be reconsidered.

Claims 24, 29 – 30, 32, 34, 38 and 41 are rejected as being obvious in light of the combination of Colombo '678 with Buchanan '591. The addition of Buchanan '591 does not remedy the aforementioned deficiencies of the Colombo '678 reference. Further, since Buchanan '591 discloses a deposition process for a metal oxide film, on a silicon layer, and it does not teach, disclose or suggest a deposition of a MSiO or MSiN film (i.e. a layer containing silicon), as per the instant invention, Buchanan '591 either alone or in combination with Colombo '678 teaches away from the instant invention. For at least these reasons, the Applicants respectfully contend that the basis for this rejection should be reconsidered.

Claims 21, 25, 27-28, 37 and 39 are rejected as being obvious in light of the combination of Colombo '678 with Buchanan '591 and Oshita.

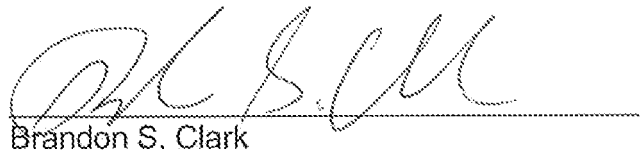
The addition of Oshita does not remedy the aforementioned deficiencies of Colombo '678 and Buchanan '591. Oshita describes methods of depositing films

which contain a minimum of carbon content, from a precursor which contains carbon (namely SiH(NEt2)3). Oshita does not teach or suggest a silicon source which is free of carbon. The Applicants respectfully contend that the Examiner's statement that "it would have been obvious to have a molecular structure absent carbon, as carbon acts as an impurity which increases leakage current ..." is an example of impermissible hindsight. One of skill in the art, taught by Oshita the desirability of minimizing the carbon content in the final film, would not find a teaching or a suggestion as to carbon free silicon precursors suitable for deposition of MSiON or MSiN films. For at least these reasons, the Applicants respectfully contend that the basis for this rejection should be reconsidered.

CONCLUSION

Accordingly, it is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited. Should the Examiner believe a telephone call would expedite the prosecution of the application, he is invited to call the undersigned attorney at the number listed below.

Respectfully submitted,



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Date: **June 30, 2008**

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